Efficacy of prone ventilation in adult patients with acute respiratory failure: a meta-analysis

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CRD summary
The authors concluded that in adults with acute respiratory failure, prone position ventilation was associated with improved oxygenation and possibly an increase in pressure sores, but there was no reduction in mortality, pneumonia or intensive care unit stay. This was generally a well-conducted and clearly reported review. The authors’ conclusions were likely to be reliable.

Authors' objectives
To evaluate the efficacy of prone ventilation in adults with acute lung injury or acute respiratory distress syndrome who require invasive mechanical ventilation.

Searching
MEDLINE, EMBASE, Cochrane Controlled Trials Register, Registry of Current Controlled Trials, DARE, NHS Economic Evaluation Database and the Health Technology Assessment database were searched from 1966 to July 2006. Search terms were reported. No language restrictions were applied. Reference lists of reviews and included studies were screened.

Study selection
Randomised controlled trials (RCTs) that compared prone position ventilation with supine ventilation in adults (>18 years) with acute lung injury or acute respiratory distress syndrome who required intubation and mechanical ventilation were eligible for inclusion. The primary review outcome was mortality. Secondary outcomes were changes in oxygenation, duration of mechanical ventilation, intensive care unit and hospital stay, complications related to endotracheal tube, intravascular catheters and pressure sores.

Where stated in the included studies, the most common cause of respiratory failure was pneumonia or trauma, mean age ranged from 40 to 66 years and the mean duration of the prone position ranged from six to 17 hours. Studies differed in the severity of respiratory failure.

Two reviewers independently selected studies and resolved disagreements through consensus.

Assessment of study quality
Two reviewers independently assessed validity using allocation concealment, intention-to-treat (ITT) analysis and the Jadad criteria (randomisation, blinding and withdrawals). The maximum possible Jadad score was 5 points. Discrepancies were resolved through consensus.

Data extraction
Two reviewers independently extracted data as odds ratios (OR) or weighted mean differences (WMD) with 95% confidence intervals (CI). Discrepancies were resolved through consensus.

Methods of synthesis
Pooled OR and WMD with 95% CIs were calculated using a random-effects model. Heterogeneity was assessed using the Cochrane Q and the I² statistics.

Results of the review
Five RCTs were included (n=1,287). Jadad scores ranged from 1 to 3. Four studies reported allocation concealment and four reported ITT analysis.

There was no statistically significant difference between ventilation in the prone and supine position in mortality, OR 0.98 (95% CI: 0.7, 1.3, p=0.91; four studies). No significant heterogeneity was found (p=0.30, I² 18%).
The prone position was associated with significantly higher levels of oxygenation compared to the supine position, WMD 21.2 mmHg (95% CI: 12.4, 10.0, p<0.001; five studies). No significant heterogeneity was found (p=0.90, I^2 0%).

There was a nonstatistically significant increase in pressure sores in the prone ventilation group, OR 1.95 (95% CI: 0.09, 4.15, p=0.08; three studies). No significant heterogeneity was found (p=0.30, I^2 16.8%).

There was no statistically significant difference between prone and supine position in ventilator-associated pneumonia (four studies), the duration of intensive care unit stay (three studies) or endotracheal tube complications (four studies).

Cost information
None of the included studies reported costs.

Authors' conclusions
In adults with acute respiratory failure, prone position ventilation was associated with improved oxygenation and possibly an increase in pressure sores, but there was no reduction in mortality, pneumonia or intensive care unit stay.

CRD commentary
The review question was clearly stated and inclusion criteria were specified. Several relevant sources were searched and no language restrictions were applied. However, no specific attempts were made to minimise publication bias. Appropriate methods were used to minimise reviewer error and bias during the review process. Study validity was assessed using defined criteria and results were reported. Statistical heterogeneity was assessed and studies were appropriately pooled. Evidence was based on only a small number of RCTs, some of which were of limited quality. Overall, this was a well-conducted and clearly reported review and the authors’ conclusions were likely to be reliable.

Implications of the review for practice and research
The authors did not state any implications for practice or further research.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.